

WHAT IS CLAIMED IS:

1. A mold assembly for manufacturing concrete blocks and adapted for use in a concrete block machine, the mold assembly comprising:
 - a plurality of liner plates, each having a major surface, the liner plates configured such that the major surfaces form a mold cavity having a desired form; wherein at least one of the liner plates is moveable;
 - a gear drive assembly selectively coupled to the at least one moveable liner plate and configured to move the liner plate in a first direction toward an interior of the mold cavity by applying a force in a second direction different from the first direction, and to move the liner plate in a direction away from the interior of the mold cavity by applying a force in a direction opposite the second direction.
2. The mold assembly of claim 1, wherein the first direction is toward a center of the mold cavity and the second direction is perpendicular to the first direction.
3. The mold assembly of claim 1, wherein the gear drive assembly comprises:
 - a first gear element having a plurality of substantially parallel angled channels and selectively coupled to the at least one movable liner plate;
 - a second gear element having a plurality of substantially parallel angled channels configured to slidably interlock with the angled channels of the first gear element; and
 - an actuator selectively coupled to the second gear element and configured to apply to the second gear element the force in the second direction causing the second gear element to move in the second direction and the first gear element and at least one

moveable liner plate to move toward the interior of the mold cavity, and to apply to the second gear element the force opposite the second direction to move the first gear element and at least one moveable liner plate away from the interior of the mold cavity.

4. The mold assembly of claim 3, wherein an angle of the plurality of substantially parallel angled channels ranges between forty-five degrees and ninety degrees as measured from an axis perpendicular to the major surface of the at least one moveable liner plate and extending away from an interior of the mold cavity, wherein a ninety degree angle is substantially parallel with the major surface and a zero degree angle is substantially perpendicular to the major surface.
5. The mold assembly of claim 4, wherein a preferred angle is substantially equal to seventy degrees.
6. The mold assembly of claim 3, wherein the first gear element is plate-shaped with the plurality of substantially parallel angled channels on a first major surface.
7. The mold assembly of claim 3, wherein the first gear element is substantially cylindrical in shape with the plurality of substantially parallel angled channels on a planar surface, wherein the planar surface is substantially tangentially to a radius of the cylinder.
8. The mold assembly of claim 3, wherein the second gear element is substantially cylindrical in shape with the plurality of substantially parallel angled channels on a planar surface, wherein the planar surface is substantially tangentially to a radius of the cylinder.
9. The mold assembly of claim 3, wherein the actuator is a linear actuator.

10. The mold assembly of claim 9, wherein the actuator comprises a cylinder having a piston rod selectively coupled to the second gear element.
11. The mold assembly of claim 10, wherein the cylinder is a pneumatic cylinder.
12. The mold assembly of claim 10, wherein the cylinder is a hydraulic cylinder.
13. The mold assembly of claim 10, wherein the cylinder comprises a single rod-end double-acting cylinder.
14. The mold assembly of claim 9, wherein the linear actuator comprises a threaded drive.
15. The mold assembly of claim 3, further comprising:
a mold frame having a plurality of frame members each having a major surface and selectively coupled to one another such that the major surfaces form a mold box.
16. The mold assembly of claim 15, wherein the plurality of liner plates are located within the mold box with each liner plate corresponding to a frame member.
17. The mold assembly of claim 16, wherein the frame member corresponding to the at least one moveable liner plate includes:
a gear opening extending into the frame member from the major surface and configured to slidably receive the first gear element; and
a plurality of guide holes extending into the frame member from the major surface.

18. The mold assembly of claim 17, wherein the at least one moveable liner plate further includes a plurality of guide posts extending from a surface opposite the major surface with one guide post corresponding to each guide hole, wherein each guide post is configured to slidably insert into the corresponding guide hole.
19. The mold assembly of claim 18, further including a plurality of guide post bushings, one inserted in each guide hole such that the guide post bushing slidably receives the corresponding guide post.
20. The mold assembly of claim 17, further comprising a gear track configured to slidably insert into the gear opening and configured to slidably receive the first gear element.
21. The mold assembly of claim 17, wherein the frame member corresponding to the at least one moveable liner further includes a gear shaft extending from an end surface of the frame member and running substantially perpendicular to and at least partially intersecting with the gear opening.
22. The mold assembly of claim 21, wherein the actuator and second gear element together form a drive unit which is configured to slidably insert into the gear shaft such that the second gear element is positioned at least partially within the gear opening.
23. The mold assembly of claim 1, further comprising a liner face selectively coupled to front surface of at least one liner plate of the plurality of liner plates, wherein the liner face comprises, at least partially, a negative a desired block shape.
24. The mold assembly of claim 23, wherein the liner face includes a negative of a pattern to be imprinted on a surface of a concrete block.

25. The mold assembly of claim 23, wherein the liner face comprises a polyurethane material.
26. The mold assembly of claim 23, wherein the liner face comprises a metal or metal alloy material.
27. A mold assembly for manufacturing concrete blocks and adapted for use in a concrete block machine, the mold assembly comprising:
 - a mold frame comprising:
 - a pair of side members;
 - a pair of cross members selectively coupled between the side members to form a mold box; and
 - a plurality of division plates parallel with and between the cross members each selectively coupled between the side members to form a plurality of sub-boxes;
 - a pair of moveable liner plates within each sub-box, one corresponding to each side member and each having a major surface such that the major surfaces and adjacent division plates form a mold cavity within each sub-box; and
 - a gear drive system selectively coupled to each moveable liner plate and configured to move each liner plate in a first direction toward an interior of its corresponding mold cavity by applying a force in a second direction different from the first direction, and to move the liner plate away from the mold cavity interior by applying a force in a direction opposite the second direction.
28. The mold assembly of claim 27, wherein the first direction is toward a center of the mold cavity and the second direction is perpendicular to the first direction.
29. The mold assembly of claim 27, wherein the gear drive system is configured to simultaneously move each moveable liner plate a same distance.

30. The mold assembly of claim 27, wherein the gear drive system is configured to simultaneously move the moveable liner plates different distances.

31. The mold assembly of claim 27, wherein the gear drive system comprises:

a pair of gear drive assemblies, one associated with each side member and configured to move each moveable liner plate corresponding to its associated side member.

32. The mold assembly of claim 31, wherein each gear drive assembly comprises:

a plurality of first gear elements, each having a plurality of substantially angled channels and selectively coupled to a different one of the plurality of moveable liner plates corresponding to the associated side member;

a second gear element having a plurality of substantially parallel angled channels configured to slidably interlock with the angled channels of each of the plurality of first gear elements; and

an actuator selectively coupled to the second gear element and configured to apply to the second gear element the force in the second direction causing each first gear element and corresponding liner plate to move toward the interior of the corresponding mold cavity, and to apply to the second gear element the force opposite the second direction causing each first gear elements and corresponding liner plate to move away from the interior of the corresponding mold cavity.

33. The mold assembly of claim 32, wherein the second gear element comprises a plurality of groups of substantially parallel angled channels, each group of angled channels corresponding to and configured to slidably interlock

with the angled channels of a different one of the first gear elements of the plurality of first gear elements.

34. The mold assembly of claim 33, wherein an angle of the plurality of substantially parallel angled channels ranges between forty-five degrees and ninety degrees as measured from an axis perpendicular to the major surface of the liner plate and extending away from the interior of the mold cavity, wherein a ninety degree angle is substantially parallel with the major surface and a zero degree angle is substantially perpendicular to the major surface.

35. The mold assembly of claim 34, wherein a preferred angle is substantially equal to seventy degrees.

36. The mold assembly of claim 34, wherein the angle of the substantially parallel angled channels of each group of the second gear element is substantially equal to the angle of the substantially parallel angled channels of its corresponding first gear element and wherein the angle of the substantially parallel angled channels varies from group to group such that the moveable liner plates will move a different distance toward the interior of the correspond mold cavity in response to the second force being applied to the second gear element.

37. The mold assembly of claim 32, wherein each first gear element is a rectangular plate with the plurality of angled channels on a first major surface.

38. The mold assembly of claim 32, wherein each first gear element is substantially cylindrical with the plurality of substantially parallel angled channels on a planar surface, wherein the planar surface is substantially tangential to a radius of the cylindrical.

39. The mold assembly of claim 32, wherein the second gear element is substantially cylindrical with the plurality of substantially parallel angled

channels on a planar surface, wherein the planar surface is substantially tangential to a radius of the cylindrical.

40. The mold assembly of claim 32, wherein the actuator is a linear actuator.

41. The mold assembly of claim 40, wherein the actuator comprises a piston having a piston rod selectively coupled to the second gear element.

42. The mold assembly of claim 41, wherein the piston is a hydraulic piston.

43. The mold assembly of claim 41, wherein the piston is a pneumatic piston.

44. The mold assembly of claim 40, wherein the actuator comprises a threaded drive.

45. The mold assembly of claim 32, wherein each side member includes a plurality of gear openings, one associated with each sub-box and each configured to slidably receive a first gear element of a corresponding moveable liner plate.

46. The mold assembly of claim 45, further including a plurality of gear tracks each configured to slidably insert into a different one of the plurality of gear openings and configured to slidably receive a first gear element.

47. The mold assembly of claim 32, wherein each side member includes a plurality of guide holes associated with each sub-box.

48. The mold assembly of claim 47, wherein the pair of moveable liner plates associated with each sub-box each have a plurality of guide posts extending from a surface opposite the major surface, wherein each guide post is configured to slidably insert into a different one of the plurality of guide holes.

49. The mold assembly of claim 48, further comprising a plurality of guide post bushings, one inserted into each of the plurality of guide holes and configured to slidably receive a corresponding guide post.
50. The mold assembly of claim 27, further comprising a liner face selectively coupled to the major surface of at least one of the moveable liner plates.
51. The mold assembly of claim 50, wherein the liner face comprises, at least partially, a negative of a desired block shape.
52. The mold assembly of claim 50, wherein the liner face comprises a negative of a desired pattern to be imprinted on a surface of a concrete block.
53. The mold assembly of claim 50, wherein the liner face comprises a polyurethane material.
54. The mold assembly of claim 50, wherein the liner face comprises a metal alloy.
55. A sliding gear assembly comprising:
 - a first slidable gear element having a plurality of substantially parallel angled channels and configured to selectively couple to a moveable load; and
 - a drive unit including a second slidable gear element having a plurality of substantially parallel angled channels configured to slidably interlock with the plurality of substantially parallel angled channels of the first slidable gear element, wherein the drive unit is configured to slide the first slidable gear element in a first direction by sliding the second slidable gear element in a second direction different from the first direction and to slide the first slidable gear element in a direction opposite the first direction by

sliding the second gear element in a direction opposite the second direction.

56. The sliding gear assembly of claim 55, wherein the drive unit further comprises:

a double acting cylinder-piston comprising:

a cylinder body;

a piston connectable to a power medium; and

a piston rod having a longitudinal axis, wherein the piston rod is selectively coupled to an external element such that the piston rod remains static and the cylinder body slides along the longitudinal axis of the piston rod in response to the piston being driven by the power medium, and wherein the second direction and the direction opposite the second direction are along the longitudinal axis of the piston rod.

57. The sliding gear assembly of claim 56, wherein the second slidable gear element is selectively coupled to the cylinder body.

58. The sliding gear assembly of claim 57, wherein the second slidable gear element comprises a sleeve configured to selectively couple around an outside surface of the cylinder body.

59. The sliding gear assembly of claim 56, wherein the cylinder body includes a plurality of substantially parallel angled channels configured to slidably interlock with the plurality of substantially parallel angled channels of the first slidable gear element such that the cylinder body and integral parallel angled channels together form the second slidable gear element.

60. The sliding gear assembly of claim 56, wherein the piston rod is a single rod-end piston rod wherein the rod-end is configured selectively couple to the external element.
61. The sliding gear assembly of 60, wherein the single rod-end piston rod comprises a tube.
62. The sliding gear assembly of claim 61, wherein the piston is configured to receive the power medium via the piston rod and via a flexible connection through the cylinder body.
63. The sliding gear assembly of claim 60, wherein the piston rod is a double rod-end piston rod wherein each rod-end configured to selectively couple to the external element.
64. The sliding gear assembly of 63, wherein the double-rod end piston rod comprises a tube.
65. The sliding gear assembly of claim 63, wherein the piston is configured to receive the power medium via each end of the piston rod.
66. The sliding gear assembly of claim 56, wherein the double-acting cylinder-piston is pneumatic and wherein the power medium comprises compressed air.
67. The sliding gear assembly of claim 56, wherein the double-acting cylinder-piston is hydraulic and wherein the power medium comprises hydraulic fluid.